

WHAT IS CLAIMED IS:

1. A slide device in combination with a seat and a floor, comprising:

a pair of lower track elements fixed on said floor;

a pair of upper slide elements slidably engaged on the respective said pair of lower track elements so as to be movable therealong in forward and backward directions, said pair of upper slide elements being connected with said seat;

a drive means provided in said floor, said drive means being operable in one of a normal direction and a reverse direction;

a flexible drive transmission means operatively and flexibly connected between said pair of upper slide elements and said drive means, with such an arrangement that, upon operation of said drive means in said normal direction, a corresponding normal drive force is transmitted through said flexible drive transmission means to said pair of upper slide elements, thereby causing movement of the pair of upper slide elements in the forward direction along said pair of lower track elements, and that, upon operation of said drive means in said reverse direction, a corresponding reverse drive force is transmitted through said flexible drive transmission means to said pair of upper slide elements, thereby causing movement of the pair of upper slide elements in the backward direction along said pair of lower track elements;

a locking means operable for locking and unlocking said pair of upper slide elements to and from said pair of lower track elements;

a lock operation/control means arranged between said locking means and said drive means, said lock operation/control means being normally set in a locking position and operable therefrom toward one of normal unlocking position and reverse unlocking position, such that, when the lock operation/control means is set in said locking position, both of said drive and locking means are in an inoperative state, that operation of the lock operation/control means in said normal unlocking position causes said locking means to unlock said pair of upper slide elements from said pair of lower track elements, while simultaneously activating said drive means to operate in said normal direction, and that operation of the lock

operation/control means in said reverse unlocking direction causes said locking means to unlock said pair of upper slide elements from said pair of lower track elements, while simultaneously activating said drive means to operate in said reverse direction;

said lock operation/control means including:

a lock operation means operable to a selected one of a first unlocking position and second unlocking position in relation to a neutral locking position, said lock operation means being operatively connected with said locking means, and being normally set in said neutral unlocking position, wherein said first unlocking position and said second locking position correspond to said normal and reverse unlocking directions, respectively;

and

a start switch means operable to a selected one of a normal switch-on position and a reverse switch-on position in relation to a neutral switch-off position, said start switch being electrically connected with said drive means and being normally set in said neutral switch-off position, wherein said normal and reverse switch-on positions correspond to said normal and reverse directions associated with said drive means, respectively,

with such an arrangement that, when said lock operation/control means is set in said locking position, said lock operation means and said start switch means being set in said neutral locking position and said neutral switch-off position, respectively, whereby said pair of upper slide elements are locked to said pair of lower track elements, that, when said lock operation/control means is operated in said normal unlocking direction, said lock operation means is operated in said first unlocking position to cause operation of said locking means to unlock said upper slide element from said lower track element, while simultaneously, said start switch means is operated to said normal switch-on position, which in turn causes said drive means to operate in said normal direction, thereby causing movement of said pair of upper slide elements in said forward direction along said pair of lower track elements through said flexible drive transmission means, and that, when said lock operation/control means is operated in said reverse unlocking direction, said lock operation

means is operated in said second unlocking position to cause operation of said locking means to unlock said upper slide element from said lower track element, while simultaneously, said start switch means is operated to said reverse switch-on position, which in turn causes said drive means to operate in said reverse direction, thereby causing movement of said pair of upper slide elements in said backward direction along said pair of lower track elements through said flexible drive transmission means.

2. The slide device as claimed in Claim 1, wherein said pair of lower track elements are greater in length than said pair of upper slide elements.

3. The slide device according to Claim 2, wherein said pair of lower track elements comprises a pair of long lower rail, and wherein said pair of upper slide elements comprises a pair of upper rail slidably fitted in said long lower rail.

4. The slide device as claimed in Claim 1, wherein one of said pair of lower track elements has a first end and a second end, and another of said pair of lower track elements has a first end and a second end,

wherein said flexible drive transmission means comprises: a first flexible drive transmission element flexibly extended between said drive means and said first end of said one of said pair of lower track elements; and a second flexible drive transmission element flexibly extended between said drive means and said second end of said another of said pair of lower track elements,

wherein said first flexible drive transmission element has: one end portion extending toward said first end of said one of said pair of lower track elements and is connected with one of said pair of upper slide elements; and another end portion connected with said drive means,

wherein said second flexible drive transmission element has: one end portion extending toward said second end of said another of said pair of lower track elements and is connected with another of said pair of upper slide elements; and another end portion

connected with said drive means, and

wherein said one end portion of said first flexible drive transmission element enters said first end of said one of said pair of lower track elements and extends in and along said one of said pair of lower track elements, while on the other hand, said one end portion of second flexible drive transmission elements enters said second end of said another of said pair of lower track elements and extends in and along said another of said pair of lower track elements,

whereupon a whole of said first and second flexible drive transmission elements assumes a generally "Z" or "inverted Z" shape in plan.

5. The slide device according to Claim 4, wherein said one end portion of said second flexible drive transmission element extends toward said second end of said one of said pair of lower track elements and is connected with said one of said upper slide elements, such that said one end portion of the second flexible drive element enters said second end of said one of said pair of lower track elements and extends in and along said one of said pair of lower track elements, whereupon a whole of said first and second flexible drive transmission elements assumes a generally triangular shape in plan with respect to said one of said pair of lower track elements.

6. The slide device according to Claim 4, wherein

said first flexible drive transmission element comprises a first flexible wire cable element formed by an outer tube and a wire cable slidably inserted in said outer tube, said wire cable having: one exposed portion extending outwardly from said outer tube, said one exposed portion corresponding to said one end portion of said first flexible drive transmission element and being connected with said one of said pair of upper slide elements; and another exposed portion corresponding to said another end portion of the first flexible drive transmission element and being connected with said drive means,

wherein said second flexible drive transmission element comprises a second flexible wire cable element formed by an outer tube and a wire cable slidably inserted in said

outer tube, said wire cable having: one exposed portion extending outwardly from said outer tube, said one exposed portion corresponding to said one end portion of said second flexible drive transmission element and being connected with said another of said pair of upper slide elements; and another exposed portion corresponding to said another end portion of the second flexible drive transmission element, and

wherein said one exposed portion of said first flexible wire cable element enters said first end of said one of said pair of lower track elements and extends in and along said one of said pair of lower track elements, while on the other hand, said one exposed portion of said second flexible wire cable elements enters said second end of said another of said pair of lower track elements and extends in and along said another of said pair of lower track elements.

7. The slide device according to Claim 4, wherein said first and second ends of each of said pair of lower track elements are each provided with a rotatable pulley thereon, wherein said one exposed portion of said first flexible wire cable element is partly contacted about said rotatable pulley so as to extend rectilinearly in and along said one of said pair of lower track elements and be connected with said one of said pair of upper slide elements, and wherein said one exposed portion of said second flexible wire cable element is partly contacted about said rotatable pulley so as to extend rectilinearly in and along said another of said pair of lower track elements and be connected with said another of said pair of upper slide elements.

8. The slide device as claimed in Claim 4, wherein there is provided an auxiliary flexible drive transmission means workable in conjunction with said flexible drive transmission means to allow smooth transmission of said corresponding normal and reverse drive forces therethrough, thereby insuring movement of the pair of upper slide elements in the forward and reverse directions along said pair of lower track elements, and

wherein said auxiliary flexible drive transmission means comprises one auxiliary flexible drive transmission element provided between said pair of lower track elements in such

a manner that one end portion of said auxiliary flexible drive transmission element extends toward said second end of said one of said pair of lower track elements and is connected with said one of said pair of upper slide elements, while another end portion of said auxiliary flexible drive transmission element extends toward said first end of said one of said pair of lower track elements and is connected with said another of said pair of upper slide elements,

whereupon a whole of said first and second flexible drive transmission elements and said auxiliary flexible drive transmission element assumes a generally "figure-of-eight" shape in plan.

9. The slide device according to Claim 8, wherein said auxiliary flexible drive transmission element comprises an auxiliary flexible wire cable element formed by an outer tube having one end and another end and a wire cable slidably inserted in said outer tube,

said wire cable having: one exposed portion extending outwardly from said one end of said outer tube, said one exposed portion corresponding to said one end portion of said auxiliary flexible drive transmission element and being connected with said one of said pair of upper slide elements; and another exposed portion extending outwardly from said another end of said outer tube, said another exposed portion corresponding to said another end portion of said auxiliary flexible drive transmission element and being connected with said another of said pair of upper slide elements,

and

wherein said one exposed portion of said auxiliary flexible wire cable element enters said second end of said one of said pair of lower track elements and extends in and along said one of said pair of lower track elements, while on the other hand, said another exposed portion of said auxiliary flexible wire cable element enters said first end of said another of said pair of lower track elements and extends in and along said another of said pair of lower track elements.

10. The slide device according to Claim 9, wherein said first and second ends of each of said pair of lower track elements are each provided with a rotatable pulley thereon,

wherein said one exposed portion of said auxiliary flexible wire cable element is partly contacted about said rotatable pulley so as to extend rectilinearly in and long said one of said pair of lower track elements and be connected with said one of said pair of upper slide elements, and wherein said another exposed portion of said auxiliary flexible wire cable element is partly contacted about said rotatable pulley so as to extend rectilinearly in and long said another of said pair of lower track elements and be connected with said another of said pair of upper slide elements.

11. The slide device as claimed in Claim 1, wherein said lock means comprises a latch means movably provided in said pair of upper slide elements, said latch means being latchingly engageable and disengageable to and from said pair of lower track elements to thereby cause locking and unlocking of said pair of upper slide elements to and from said pair of lower track elements, wherein said lock operation/control means further includes a detection means for detecting said latching engagement and disengagement of said pair of upper slide elements to and from said pair of lower track elements, wherein said lock operation means comprises an operation lever operatively connected with said latch means through a connecting means, said operation lever being normally set in said neutral locking position and operable to a selected one of said first and second unlocking positions in relation to said neutral locking position, wherein said start switch means is operable in an interlocked relation with said operation lever, with such an arrangement that, when said operation lever is operated in one of said first and second unlocking positions, said drive means is not operated in neither of said normal and reverse directions until said detection means detects said latching disengagement of said latch means from said pair of lower track elements, and that, during operation of said driven means in one of said normal and reverse directions, when said operation lever is operated in said neutral locking position, said drive means continues to operate until said detection means detects said latching engagement of said latch means with said pair of lower track element.

12. The slide device as claimed in Claim 11, wherein a delay relay means is

electrically connected between said drive means and said start switch means, such that, when said operation lever is operated in said neutral locking position to stop the operation of said drive means, a predetermined delay time is given by said delay relay means prior to said drive means ceasing its operation.

13. The slide device as claimed in Claim 1, wherein said lock means comprises a latch plate movably provided in said pair of upper slide elements and a plurality of lock holes formed in said pair of lower track elements, said latch means being latchingly engageable and disengageable to and from a part of said plurality of lock holes of said lower track elements to thereby cause locking and unlocking of said pair of upper slide elements to and from said pair of lower track elements, wherein said lock operation/control means further includes: a detection means for detecting said latching engagement and disengagement of said pair of upper slide elements to and from said pair of lower track elements; and a delay relay means electrically connected between said drive means and said start switch means, said delay relay means being workable for giving a predetermined delay time prior to said drive means ceasing its operation when said operation lever is operated in said neutral locking position, wherein said predetermined delay time is preset on basis of a time required for said pair of upper slide elements to move at one pitch between one and adjacent another of said plurality of lock holes, wherein said lock operation means comprises an operation lever operatively connected with said latch means through a connecting means, said operation lever being normally set in said neutral locking position and operable to a selected one of said first and second unlocking positions in relation to the neutral locking position, and wherein said start switch means is operable in an interlocked relation with said operation lever, with such an arrangement that, when said operation lever is operated in one of said first and second unlocking positions, said drive means is not operated in neither of said normal and reverse directions until said detection means detects said latching disengagement of said latch means from said pair of lower track elements, and that, during operation of said drive means in one of said normal and reverse directions, when said operation lever is operated in said neutral locking position, said drive means continues to operate for said predetermined delay time and until said



detection means detects said latching engagement of said latch means with said pair of lower track element.

14. The slide device according to Claim 11, wherein said latch means comprises a latch plate which is movable upwardly for latching disengagement from said pair of lower track elements and also movable downwardly for latching engagement with said pair of lower track elements, wherein said connecting means comprises: a connecting rod to which said operation lever is fixed, said connecting rod being rotatably supported between said pair of upper slide elements; a link member having one end fixed to said connecting rod and another end; and an actuator arm member rotatably supported by said pair of upper slide elements, said actuator arm member having: one end connected via a joint member with said another end of said link member; and another end pivotally connected with said latch plate, wherein said link member is normally set in a generally horizontal position corresponding to said neutral locking position of said operation lever and rotatable clockwise and anticlockwise by operation of said operation lever to said first and second unlocking positions, in such a manner that clockwise and anticlockwise rotation of said link member from said generally horizontal position inevitably results in upward disengagement of said latch plate from said pair of lower track elements, wherein said drive means includes an electric motor, wherein said detection means comprises an electronic control element and a slide switch electrically connected with said electronic control element, wherein said electronic control element is electrically connected with said electric motor of said drive means, wherein said slide switch is disposed in a path along which said latch plate is moved vertically, such that, when said latch plate is moved upwardly and completely disengaged from said pair of lower track elements, the slide switch is turned on, sending an unlocking signal to said electronic control element which in turn sends an "on" signal to said electric motor, whereby the electric motor is operated in a direction corresponding to one of said normal and reverse directions.

15. The slide device as claimed in Claim 1, wherein said lock operation/control

means further includes: a detection means for detecting said latching engagement and disengagement of said pair of upper slide elements to and from said pair of lower track elements; and a delay relay means electrically connected between said drive means and said start switch means, said delay relay means being workable for giving a predetermined delay time prior to said drive means ceasing its operation when said operation lever is operated in said neutral locking position, wherein said lock operation means and said start switch means comprise a combination of a switch element and an actuator, wherein said switch element is electrically connected with said actuator and said drive means via an electronic controller and a delay relay means, wherein said switch element corresponds to said start switch means and thus is operable to a selected one of said normal and reverse switch-on positions in relation to said neutral switch-off position in which the switch element is normally set, and wherein said actuator is operatively connected with said latch means, with such an arrangement that operation of said switch element in either of said normal and reverse switch-on positions results in operation of said actuator to cause said disengagement of said latch means from said pair of lower track elements, that, when said operation lever is operated in one of said first and second unlocking positions, said drive means is not operated in neither of said normal and reverse directions until said detection means detects said latching disengagement of said latch means from said pair of lower track elements, and that, during operation of said driven means in one of said normal and reverse directions, when said operation lever is operated in said neutral locking position, said drive means continues to operate for said predetermined delay time and until said detection means detects said latching engagement of said latch means with said pair of lower track element.

16. The slide device as claimed in Claim 15, wherein said latch means comprises a latch plate movably provided in said pair of upper slide elements and a plurality of lock holes formed in said pair of lower track elements, said latch plate being latchingly engageable and disengageable to and from a part of said plurality of lock holes of said lower track elements to thereby cause locking and unlocking of said pair of upper slide elements to and from said pair of lower track elements, and wherein said predetermined delay time is preset on basis of a

time required for said pair of upper slide elements to move at one pitch between one and adjacent another of said plurality of lock holes, with such an arrangement that operation of said switch element in either of said normal and reverse switch-on positions results in operation of said actuator to cause disengagement of said latch plate from said part of said plurality of lock holes, that, when said operation lever is operated in one of said first and second unlocking positions, said drive means is not operated in neither of said normal and reverse directions until said detection means detects said disengagement of said latch plate from said part of said plurality of lock holes, and that, during operation of said driven means in one of said normal and reverse directions, when said operation lever is operated in said neutral locking position, said drive means continues to operate for said predetermined delay time and until said detection means detects engagement of said latch plate with another part of said plurality of lock holes.